Why Network Engineering Needs to Change

Introduction

For the longest while, the mantra that business leaders and IT executives used to describe how well-run IT functions should perform was that they should perform like a utility. By that they meant that IT services should have the same availability, reliability, performance and invisibility as other utilities such as electricity. Today, business leaders and IT executives still want the IT function to exhibit utility-like characteristics particularly in the area of low cost, but they also use two new mantras to describe how a well-run IT function should perform. One of these mantras is that the IT function should be closely aligned with the business and the other is that it should be agile.

This is the first in a series of two white papers. This paper will examine how the mandates to align IT with the business, become increasingly agile and continually cut cost are driving fundamental change in the way that IT organizations need to function. The second paper in the series will explain how the evolving role of the IT function is driving change in the overall role of network engineers and how network engineers plan for and approach troubleshooting functions.

The Pressure to Show Business Value

In the not too distant past, Nicholas Carr published an article in the Harvard Business Review entitled *IT Doesn't Matter*[1]. In the article, Carr stated that at one time only large sophisticated companies could afford IT and that the relative scarcity of technology enabled these companies to leverage IT for competitive advantage. Carr then argued that since IT was becoming ubiquitous it no longer provided competitive advantage. Because of that, IT organizations should reduce spending on new technologies and should focus on providing the highest possible availability for the lowest cost.

A more recent article in Forbes entitled *The Top 10 Strategic CIO Issues for 2014*[2] shows how far the industry has come since Carr published his article. The Forbes article discussed the current role of the CIO and stated that "Any CIO pining for a return to the good old days of bonuses based on server-uptime and SLA enforcement should consider swapping out the CIO title for a new one: senior director of infrastructure." The article went on to say that "The CIO job itself continues to undergo a profound transformation that is pushing business-technology leaders inexorably closer to customer demands and customer experiences and customer engagements; to revenue generation, enhancement, and optimization; and to sometimes-revolutionary new business models and operating models, and unheard-of new processes."

The pressure that CIOs face to show business value was highlighted in *The 2014 State of the WAN Report*[3]. That report contained the results of a survey in which the survey respondents were

[1] http://www.nicholascarr.com/?page_id=99
[2] http://www.forbes.com/sites/oracle/2014/01/10/the-top-10-strategic-cio-issues-for-2014/
[3] http://www.webtorials.com/main/resource/papers/webtorials/2014-WAN-SotM/WAN-2014-SotM.pdf

given a number of possible ramifications and were asked to indicate the two that best described the impacts to their company if one or more of their business-critical applications didn't perform well. The ramification mentioned most frequently was that the CIO gets pressure from their boss or from the related business unit manager to quickly fix the problem and have it not occur again.

Neither the Forbes article nor the WAN report should lead the reader to believe that the role of the CIO has totally changed. Today, the CIO is still expected to guide the operations and evolution of the IT function. That means keeping operations running and not having any major incidents relative to the deployment of new applications or any major security intrusions. The CIO is also the person ultimately responsible for ensuring that their company has the right strategy relative to the choice of vendors and the appropriate adoption of trends such as cloud computing and virtualization. This creates a complicated mix of both tactical and strategic responsibilities for contemporary leaders.

What has changed relative to the role of the CIO as explained in the Forbes article, is the CIO is now expected to ensure that the IT function is closely aligned with the company's business and functional managers. To make that new role even more challenging, in a growing number of companies the role of the CIO is under attack from other C-level executives. One example of that trend was provided by Gartner who stated that by 2017 the CMO will spend more on IT than the CIO[4]. In addition, driven by the market demand to transition from traditional bricks and mortar business models and adopt emerging digital business models, a new type of C-Level executive is emerging: The Chief Digital Officer (CDO). The CDO is typically responsible for the development and management of the company's digital business models as well as the management and delivery of the company's digital assets. Starbucks is an example of a company with a CDO. The Starbucks' CDO, Adam Brotman, is responsible for Starbucks core digital businesses, including web, mobile, social media, card, loyalty, e-commerce and Wi-Fi.[5]"

The Growing Adoption of Public Cloud Services

In the traditional IT environment, the IT organization is the exclusive provider of IT services. Part of the challenge associated with that approach is that sometimes the IT organization can't meet the needs of the business units in a timely fashion. While that has always been a problem, it is more of a problem today given the pressure that the CIO is under to show enhanced levels of business relevance.

The fact that IT organizations sometimes can't meet the needs of the business units in a timely fashion has resulted in pressure on them to be more agile and to do so in a cost effective manner. Now enter the era of cloud computing. Cloud computing is popular in large part because it

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[4] http://my.gartner.com/portal/server.pt%3Fopen%3D512%26objID%3D202%26mode%3D2%26PageID%3D5553%26ref%3Dwebinar-rss%26resId%3D1871515

[5] http://news.starbucks.com/leadership/adam-brotman

promises to enable IT organizations to achieve a dramatic improvement in the cost effective, elastic provisioning of IT services. While cloud computing was first adopted by small and medium sized companies, a couple of years ago it began to be embraced by companies of all sizes. A recent article in Forbes[6] discussed how the enterprise adoption of cloud computing continues to accelerate. That article quoted a recent IDG research report[7] that found that cloud investments have increased by 19% in large-scale enterprises (1,000+ employees) and that those enterprises are now spending on average over three million dollars a year on cloud services. That report also stated that in 2015, 24% of IT budgets will be allocated to cloud solutions, with the highest percentage being allocated to SaaS models.

In the past, the way that business unit managers often dealt with the IT organization's inability to meet their needs was by building their own shadow IT organization. The business unit managers hired or assigned responsibility to people on their staff whose role was to provide the IT services that the business unit manager was unable to obtain from the IT organization. In the current environment, public cloud providers play the role of a shadow IT organization when a company's business and functional managers go around the company's IT organization to obtain services or functionality that they either can't get from their IT organization or they can't get in a timely or cost effective manner.

Instead of trying to prevent business unit managers from acquiring public cloud services, an emerging role for the IT organization is to modify their traditional role of being the exclusive provider of IT services and to adopt a role in which they provide some IT services themselves and/or act as a broker between the company's business unit managers and cloud computing service providers. In addition to contract negotiations, the IT organization can add value by ensuring that the acquired application or service doesn't create any security or compliance issues, can perform well, can be integrated with other applications as needed, is scalable, cost effective and can be managed effectively and efficiently.

The Movement to a Software-Centric IT Function

One of the key characteristics of a traditional IT infrastructure that can cause it to be both expensive and slow to respond to new business requirements, is that it is hardware-centric and relies on dedicated servers and appliances.

Hardware-Centric

Until relatively recently, all of the key components of the infrastructure (i.e., compute, storage, networking) were hardware-centric. Using networking as an example, network components (switches, routers, WAN optimization controllers (WOCs), Application Delivery Controllers

[6] http://www.forbes.com/sites/louiscolumbus/2014/11/22/cloud-computing-adoption-continues-accelerating-in-the-enterprise/
[7] file:///D:/Desktop/Home/Downloads/246107324-IDG-Enterprise-Cloud-Computing-Research-2014.pdf

(ADCs)) have traditionally been based on dedicated appliances and each appliance was itself based on dedicated hardware such as ASICs.

Some of the implications of this approach to developing network appliances are that:

- The ASICs that provide the network functionality evolve slowly under the control of the provider of the appliance
- The appliances are proprietary
- Each appliance is configured individually
- Tasks such as provisioning, change management and de-provisioning are very time consuming and error prone.

Dedicated Servers and Appliances

In the traditional data center design, functionality such as servers, storage, LAN switches, firewalls and load balancers were typically dedicated to a single service or application. This approach resulted in stranded capacity and hence an increase in the overall cost of the data center. It also increased the time it took to deploy a new service or application since the new infrastructure must be designed, procured, installed and tested before the application could go into production.

Around five years ago IT organizations began to adopt server virtualization – which is the first step on the path to a software-centric IT function. One of the key factors driving the broad adoption of server virtualization is that it allows significant savings in the both CAPEX (i.e. the cost of server hardware) and OPEX (i.e. server management labor expense, plus facility costs such as power, cooling, and floor space). Another key factor driving adoption is that server virtualization enables IT organizations to move a production virtual machine (VM) between physical servers, which helps to streamline the provisioning of new business critical applications.

While server virtualization was the first form of virtualization to significantly impact IT organizations, most IT organizations today have implemented additional forms of virtualization including the virtualization of appliances such as WOCs and ADCs. However, until recently, the network has resisted virtualization. That is just beginning to change with the emerging adoption of Software Defined Networking (SDN).

The Open Networking Foundation (ONF) is the group that is most associated with the development and standardization of SDN. According to the ONF[8], "Software Defined Networking (SDN) is an emerging architecture that is dynamic, manageable, cost-effective, and adaptable, making it ideal for the high-bandwidth, dynamic nature of today's applications. This architecture decouples the network control and forwarding functions enabling the network

[8] https://www.opennetworking.org/sdn-resources/sdn-definition

control to become directly programmable and the underlying infrastructure to be abstracted for applications and network services." As explained in The 2015 Guide to SDN and NFV[9], SDN holds the promise of making the network significantly more agile in part by enabling a new and powerful form of network virtualization.

Summary and Conclusions

There is nothing fundamentally new about the statement that the IT function is changing. The IT function is always changing. However, the changes that currently occurring are broader and deeper than those associated with tasks such as implementing VoIP or higher speed Ethernet links.

Analogously, there is nothing fundamentally new about CIOs being under pressure to show business value, but the days as sole broker of technology are now over. One of the things that is different now is that the pace of business is getting faster and it is becoming increasingly less acceptable for the IT function to not meet the business needs, particularly when there are public cloud service providers that can. Another thing that is different is that if the CIO can't meet the emerging business requirements, other C-level executives, such as CMOs and CDOs, are poised to step in and take control.

One key facet of the technology shifts that were discussed in this paper is that they are not just some potential change predicted for the future. These shifts have already begun. Companies are currently using cloud services and the use of those cloud services is expected to increase. IT organizations have already made significant use of virtualized servers as well as virtualized appliances such as WOCs and ADCs. The use of these forms of virtualization is expected to increase and driven by the small, but emerging adoption of SDN, the use of network virtualization is expected to increase significantly.

So, there is no doubt that the IT function is changing and there is also no doubt that the changes have already begun. Those changes do, however, raise an important question: What does all of this mean to the job of network engineers? That question will be addressed in Part 2 of this series which is targeted at the changing role of the network engineer.

[9] http://www.webtorials.com/content/2014/11/the-2015-guide-to-sdn-nfv.html